KURDISH ARMOUR AGAINST ISIS

YPG/SDF tanks, technicals and AFVs in the Syrian Civil War, 2014–19

ED NASH & ALARIC SEARLE

ILLUSTRATED BY
IRENE CANO RODRÍGUEZ

NEW VANGUARD 299

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KURDISH ARMOUR AGAINST ISIS

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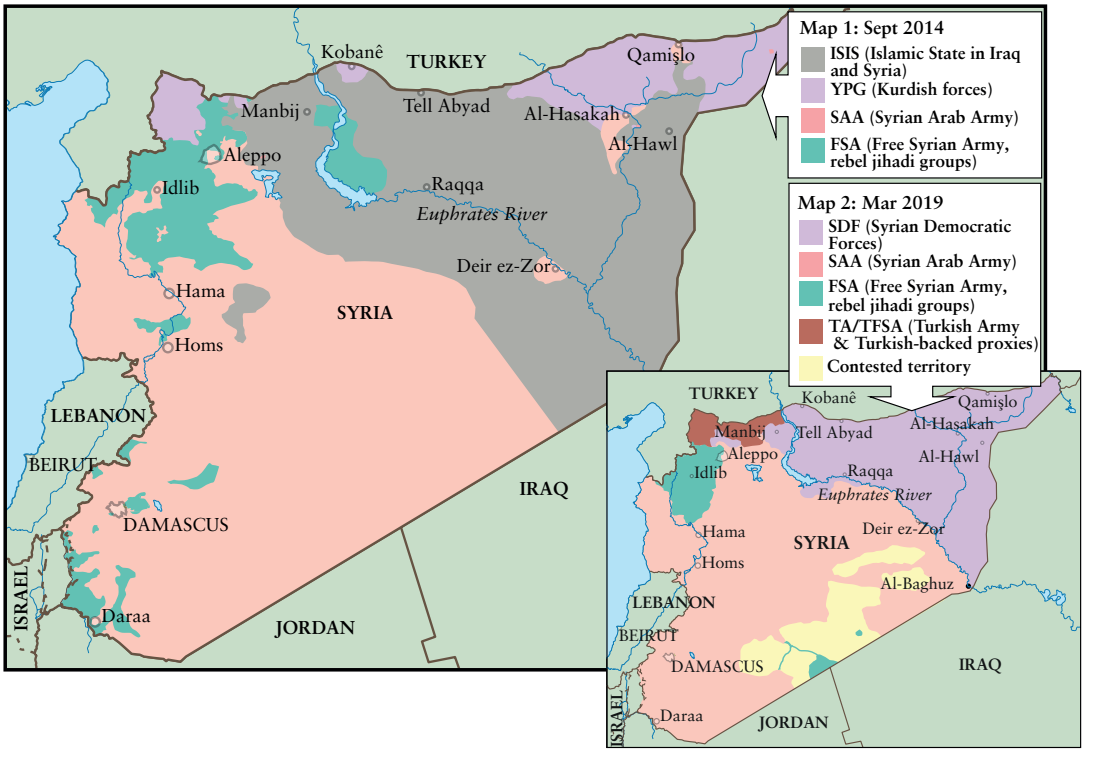
INTRODUCTION

The Arab Spring, which broke out in 2011, engulfed Syria rapidly, leading to a conflict that had begun with a burning desire to overthrow the regime of the Assad family, but soon turned into a brutal civil war. International intervention in the conflict added to the confusion of competing ethnic and tribal loyalties. It was the sudden and violent rise in 2014 of the Islamic State in Iraq and Syria (ISIS), however, which propelled the Kurdish forces seeking to resist its advance in Syria into the spotlight of the world's media.

Following ISIS's seizure of the city of Raqqa from the Syrian opposition in mid-January 2014, a major event in the rise of the Islamist group was its unexpected capture of Mosul, Iraq's second largest city, in the north-west

Two maps showing the territorial situation of the YPG in early September 2014 (Map 1) and of the SDF in late March 2019 (Map 2).



of the country, in early June. This victory followed an earlier ISIS success in Iraq when it had taken Fallujah in January. These victories not only enabled ISIS to expand as a military force: it attained the authority, in the eyes of its supporters, of a new proto-state in the Middle East, a status enhanced when its appointed leader Abu Bakr al-Baghdadi proclaimed the foundation of an Islamic caliphate in a speech in Mosul on 29 June 2014, allegedly giving him power over 1.5 billion Muslims.

The 'Caliphate' did not respect international borders and began a swift march across Syrian territory, although it largely avoided those areas still controlled by government forces in the west of the country. While in northern Iraq it was the Kurdish Peshmerga forces who resisted the advance of ISIS, in Syria it was the YPG (*Yekîneyên Parastina Gel*, People's Protection Units) which stood in the way of the murderous rampage of the 'black flag' Islamists: from a desperate fight for survival in 2014, they went on the offensive in 2015, securing final victory in March 2019.

THE ROLE OF ARMOURED FORCES IN SYRIA

While much of the fighting in the Syrian Civil War between the Kurdish YPG militia and ISIS was conducted by light infantry, the open terrain of northern Syria meant that mobile forces were to play a critical part in the key battles and operations that saw the final defeat of ISIS in Syria in March 2019. Although only available in modest numbers when compared to other post-Cold War conflicts, an assortment of armoured vehicles nonetheless played an important role in the conflict – in fact, their limited availability caused them at times to exert a disproportionate effect on morale on both sides.

Given the open terrain that characterizes large parts of northern and eastern Syria, armoured fighting vehicles (AFVs) became an increasingly important element in Kurdish units. In the first year of the conflict between the Kurds and the Islamists, the employment of 'home-made' tanks and other improvised armoured fighting vehicles (IAFVs) demonstrated that despite the availability of anti-tank weapons, AFVs – however lightly armoured – were

An interesting pair of vehicles in YPG service preparing for an operation, Abdul Aziz, October 2015. Both were captured from ISIS, which had seized them in Iraq: on the left is a Russian-designed MTLB, dating from Soviet-era supplies to Saddam Hussein; right is an American-made M1117 security vehicle, provided as part of the huge shipments the United States supplied to the post-Saddam Iraqi Army following the invasion of 2003. Both have been fitted with crude, open-top 'turrets', providing the machine-gunner with better protection than a simple gun shield; the M1117 has been equipped with a 14.5mm KPV machine gun. (Ed Nash)

still essential in military operations. By the same token, the initial sweeping success of ISIS had been largely a result of the vehicles it had been able to capture from the Iraqi Army.

ARMED GROUPS IN THE SYRIAN CIVIL WAR

The Arab Spring of 2011 saw protests and violence spread across the Arab world as tensions and dissatisfaction with autocratic governments in the region exploded. While no Arab country escaped without at least some disruption, none has suffered as much as Syria. Governed for decades by the Assad family dynasty, unrest in the country erupted into violence in 2011 as rebel military units sought to overthrow the repressive government of Bashar al-Assad. Very soon war was raging between the Free Syrian Army (FSA) and the loyalists of the Syrian Arab Army (SAA), both aided by outside powers with their own agendas in the region. As the conflict unfolded, Russia came to the aid of Assad, anxious not to lose its military bases in the country.

This conflagration meant that many areas effectively fell under local control as the central government lost its grip and focussed on its own survival, protecting its strongholds in Damascus and along the coast. Syria has always been home to a mix of races, religious outlooks and tribes; very rapidly, a kaleidoscope of different militias emerged to protect neighbourhoods and territories from other groups. Many of these were founded on religious or ethnic grounds, such as the Syriac Military Council (SMC), created to protect the Christian Assyrians. As the civil war widened, militant Sunni Jihadi movements, such as *Jabhat al-Nusra*, the Syrian affiliate of the al-Qaeda terrorist network, sought to build a power base in the north-west of the country. What had begun as an uprising, fought by a loose alliance, soon saw the FSA become progressively 'Islamized'.

Among the various groups was an obscure militia force that, until 2011, was practically unknown outside Syria – the Kurdish YPG. It was created by a political party, the *Partiya Yekîtiya Demokrat* (PYD). While it grew to be the dominant force in the war against ISIS, it cooperated at various

A crewman perches on his vehicle, Manbij, June 2016. Flying a rather tattered flag of the Manbij Military Council, this MTLB has been fitted with a form of appliqué armour, which appears to be made out of mesh-flooring material, no doubt intended to provide some stand-off protection from HEAT warheads such as those found on RPGs and anti-tank missiles. It appears, however, to be mounted too close to the vehicle to be genuinely effective. (Ed Nash)

stages with an array of militias, such as the Northern Sun Battalion (multi-ethnic), al-Sanadid (Arab) and the SMC (militia of the Syriac Union Party).

Illustrating the realities of the early days of the YPG, this photograph, taken in Aleppo in May 2013, shows the limited equipment initially available. Of equal significance is the female fighter, armed with an AK-47. Women fighters have been part of the YPG since its formation. On 3 April 2013, they were granted their own organization, the *Yekîneyên Parastina Jin* (YPJ). (Getty Images)

The YPG/YPJ

Translated into English as 'People's Protection Units', the YPG has its roots in the underground political parties which sought to further the interests of Syrian Kurds. The Kurds are considered the largest ethnic group in the world who do not possess their own state. This has made them subject to suspicion and persecution not just in Syria, but also in the surrounding countries where they can be found, most notably Iraq, Iran and Turkey.

When the civil war in Syria ignited in 2011, militias were formed to protect Syrian Kurds from the anarchy that was raging across the country. Moving swiftly to fill the void caused by the collapse of the Assad regime's power, the YPG had effectively taken control of the Kurdish-dominated areas of Syria by 2012, centred on enclaves in the north of the country, the Sheikh Maqsoud district of the city of Aleppo, the northern canton of Afrin and, most significantly, a large swathe of north-eastern Syria bordering Turkey and Iraq. This area was named *Rojava* by the Kurds.

Here an uneasy truce settled between the YPG and the regime as the latter, beset with far more dangerous enemies, accepted Kurdish control – at least, for the time being. The regime retained control of certain areas and infrastructure, including one or two districts in Qamişlo (in Arabic, al-Qamishli), later to become the de facto capital of Rojava. This new territory saw large quantities of government weapons fall into the YPG's hands, in some cases given directly by government troops as they accepted that the Kurds were in control of significant portions of territory in the north.

Among this military hardware were some armoured vehicles and tanks. For a recently formed militia, primarily a light infantry force, with few trained soldiers, these were a mixed blessing. With limited numbers and experience, the YPG was not in the position to launch conventional armoured operations against its main opponent, *Jabhat al-Nusra*, in the first years of the conflict. This group was renamed *Jabhat Fatah al-Sham* in July 2016; following a merger with other groups, it was renamed *Hay'at Tahrir al-Sham* in January 2017.

Clashes with the Islamist groups that were starting to dominate the composition of the FSA were inevitable. They held values in direct contradiction to those of the YPG and the political party it represented, the PYD. Politically, the group subscribed to the philosophical writings of Abdullah Öcalan, a Kurdish political theorist and guerrilla leader who had founded the PKK (Kurdistan Workers' Party) in Turkey in 1978. Since then, the PKK has been fighting an insurgency against the Turkish armed forces. Öcalan had developed a political theory he named 'Democratic Confederalism', which combined anarchist and libertarian ideals. Given its

A YPJ duşka crew clean their 14.5mm gun during the advance to take al-Hawl, November 2015. The vehicle chassis is a Toyota Hilux painted with a dark olive-green/black disruptive camouflage. These women fighters performed the same roles as their male compatriots and also received armoured vehicles. (Ed Nash)

largely secular orientation, this made the YPG an obvious partner for the West in its battle against ISIS.

Broadly speaking, the PYD espouses the idea that the authority of a central government should be kept to a minimum, that power should be decentralized, and local issues should be addressed at a local level; that regional, racial and religious customs should be respected and greater attention paid to ecological issues. The theory advocates a fairer redistribution of wealth along similar lines to European social democracy. It also supports gender equality, which led to one of the more remarkable creations of the organization – the Women's Protection Units, the YPJ. These units are composed exclusively of women fighters, even if many YPJ fighters serve in mixed units alongside their male counterparts. The YPJ fulfilled the same roles as the YPG and was issued equipment accordingly – including armoured vehicles and tanks when they became available.

While nominally religious freedom is espoused as a political principle, most YPG/J fighters are atheists, although culturally influenced by Muslim traditions. Given the emphasis on female equality, and years of opposition to the Turkish state among many PYD veterans, it was not surprising that the Islamists and the YPG/J despised each other.

The early fighting revolved around taking the urban centres, but mobile forces were required to move troops across open terrain. Since the YPG had practically no heavy weapons (in those early years, only a handful of medium mortars, with little knowledge of how to use them), mobile firepower was needed to support the light infantry that made up the main proportion of the YPG's combat strength.

The battle for the town of Serê Kaniyê (in Arabic, Ras al-Ayn) demonstrated the growing strength of the YPG and its first forays with mobile and armoured

A

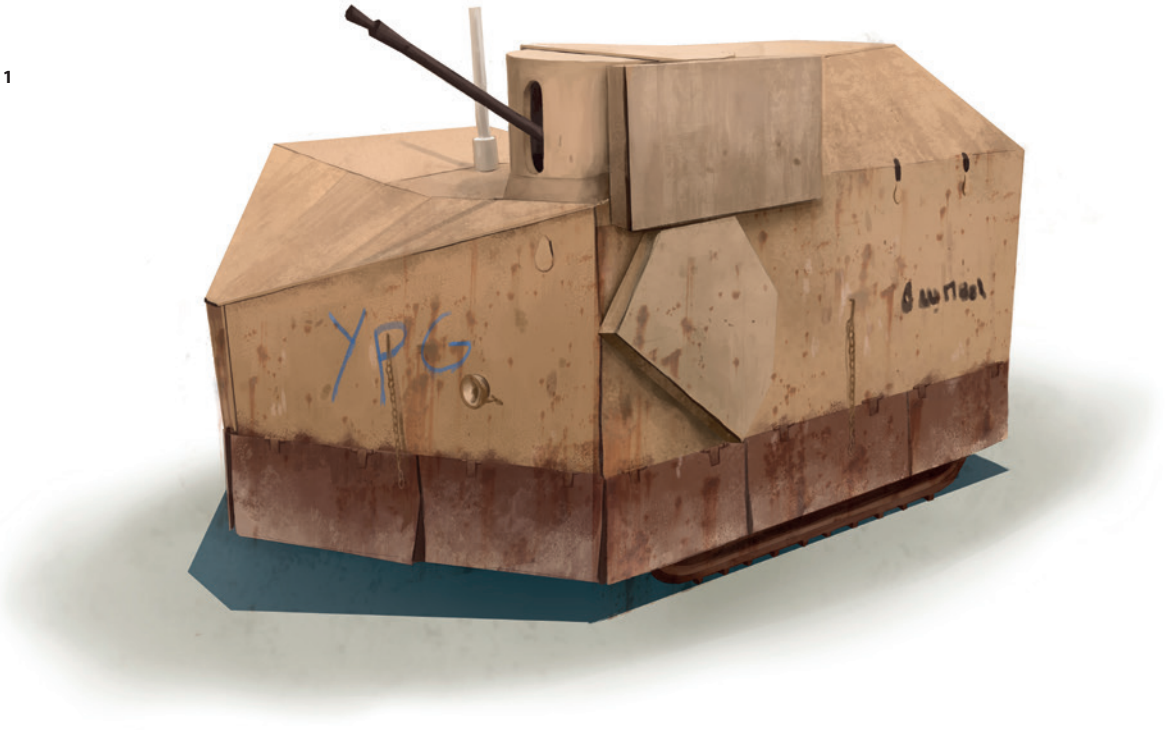
'SANDCRAWLER' IMPROVISED TANKS

These machines represented the first YPG attempts to create armoured vehicles using the chassis of caterpillar bulldozers or diggers. Although it is difficult to establish how many of these behemoths were constructed, footage from 2014 shows three vehicles built according to a similar pattern, each one slightly different. One of these improvised tanks was still intact in June 2015; it was photographed painted in a light-sand, dark-brown, camouflage pattern.

1. Sandcrawler Tank (single-turret version). This version displays a primitive construction method of steel plates around the original caterpillar vehicle: the plates have been crudely joined. It is armed with a turret-mounted 14.5mm KPV heavy machine gun, although there is limited traverse capability owing to an additional section of armour on the side, presumably to improve the level of protection. The right-hand side of the vehicle features two apertures, probably to allow AK-47s to be fired from inside.

2. Sandcrawler Tank (double-turret version). This version features two turrets, both mounting machine guns; the left-hand turret contains a 7.62mm general-purpose machine gun, while the right-hand turret is fitted with a 14.5mm KPV heavy machine gun. From the construction of the turrets, it seems there was an approximate traverse of 180 degrees. The V-shaped nose of the vehicle may have been constructed in the hope that the vehicle would be able to break through simple obstacles.

1



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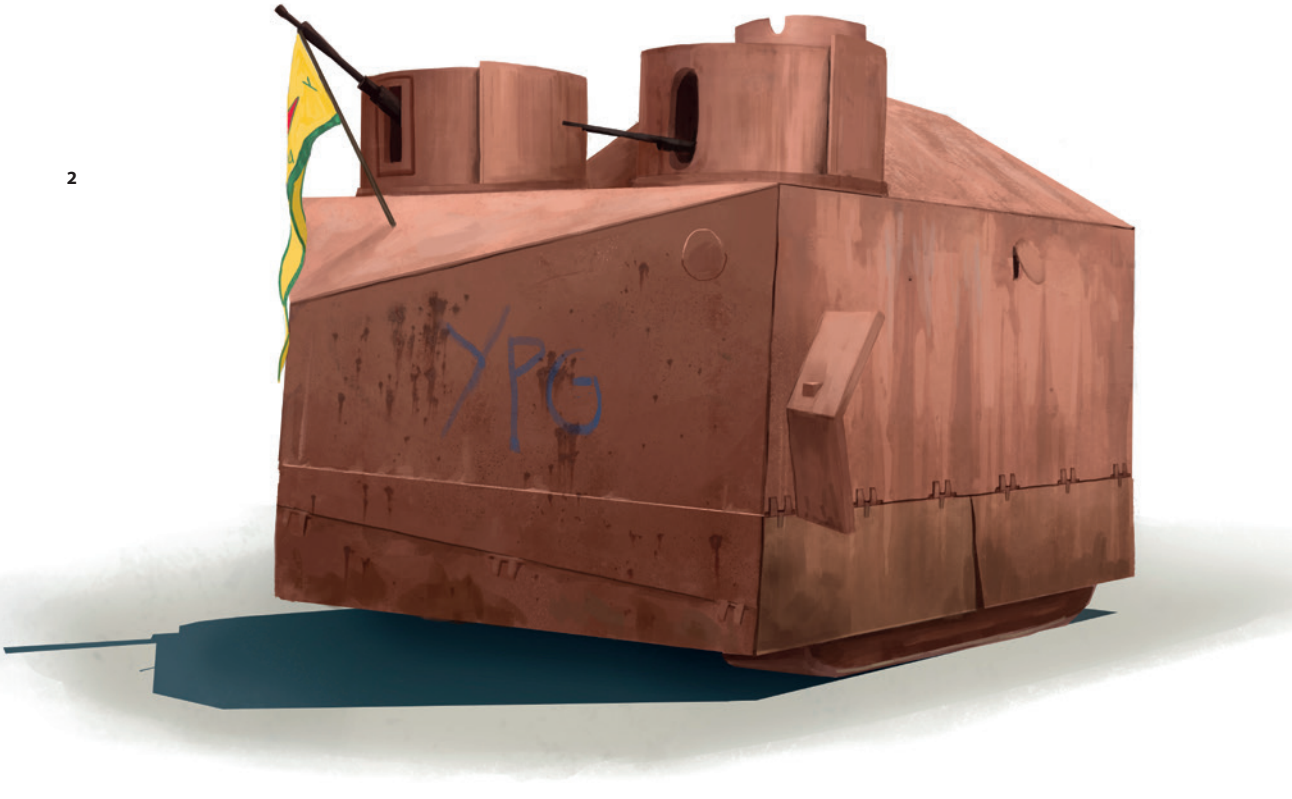


A western volunteer has added his contribution to this armoured Humvee of the Tabur Soran. The Kurds were clearly not the only ones to demonstrate an artistic flair in their paintwork. Al-Hawl, November 2015. (Ed Nash)

forces. Fought on-and-off from November 2012 until July 2013, the battle led to the expulsion of al-Nusra from the town and the first use of mobile firepower in the shape of *duşkas* (pick-up trucks fitted with heavy weapons) and IAFVs. The YPG's success showed it to be the dominant power at that time in northern Syria. But this first step in its consolidation of power was to be brought to an abrupt halt when another faction experienced a meteoric rise from relative obscurity, one that would pose the sternest test for the YPG and other groups who lived in the region. It was referred to disparagingly by its opponents as *Daesh* which is a transliteration in Arabic for the words which mean ISIS in English: depending on its conjugation in Arabic, it can also mean 'bigot'.

The Islamic State in Iraq and Syria

The evolution of ISIS – also referred to as ISIL (Islamic State in Iraq and the Levant) – is an example of militant group Darwinism in action. Initially emerging as *Jama'at al-Tawhid wal-Jihad* (JTJ) in 1999, this group was founded with the intention of toppling the Jordanian monarchy. The American invasion of Iraq in 2003 and the ensuing chaos allowed it to expand its influence there, where it gradually absorbed other Sunni Jihadi groups. In 2004, the organization pledged allegiance to al-Qaeda and became known as al-Qaeda Iraq; following further mergers in 2006, the group was recreated as the Islamic State in Iraq (ISI).

ISI cut its teeth attacking American and Iraqi security forces, establishing a reputation for savagery against civilians, particularly Shi'a Muslims. The ideology of the group, however, was uncompromising even by al-Qaeda's hardly tolerant standards, which led to division. In 2013, ISI leader Abu Bakr al-Baghdadi declared that Jabhat al-Nusra, al-Qaeda's force in Syria, was to merge with ISI to form a single entity – ISIS, the Islamic State in Iraq and Syria. This caused bitter divisions as individual fighters and factions declared allegiance to one or the other organization.

Clashes between the two forces started in late 2013 and, in February 2014, al-Qaeda formally dissociated itself from ISIS, leaving al-Nusra as its sole representative in Syria. By this point, though, ISIS was expanding its influence; and, by July 2014, it had taken much of the oil-rich Deir ez-Zor Governate on the Iraqi–Syrian border from al-Nusra.

This conquest was part of a massive expansion in ISIS territory and ambitions. Throughout the first half of 2014, ISIS fought for dominance against other Islamist groups, as well as the Syrian and Iraqi governments. In a lightning campaign that shocked the outside world, it conquered large swathes of territory, routing opposition or terrifying it into acquiescence. The Iraqi Army, painstakingly rebuilt by the Americans and foreign allies after the 2003 invasion, suffered a series of humiliating defeats.

This led to major cities such as Tikrit, Fallujah and Mosul being taken by ISIS, presenting the organization with huge quantities of resources and military hardware. It also gave foreign Jihadists a rallying point. In June 2014 it was thought that perhaps as many as 12,000 foreign fighters had arrived

Captured first from the Iraqi Army by ISIS, then later by the YPG, these early Humvees saw considerable combat use; this one is obviously showing its battle scars. Operational reliability was marginal until external support brought new vehicles and spare parts, allowing these veteran vehicles to be repaired and, in some cases, reconstituted. From what were very humble beginnings, the armoured Humvee would go on to become one of the key vehicles used by the SDF. By the end of the anti-ISIS conflict, the total number of Humvees to have served in the YPG/SDF units probably lay in the hundreds. Serê Kaniyê (Ras al-Ayn), September 2015. (Ed Nash)

in the self-proclaimed Caliphate. These developments gave the movement the 'legitimacy' it craved; and, in June 2014, the Caliphate of the Islamic State was declared. ISIS now claimed control over an area larger than Great Britain, with a population of 6 million people. There followed a series of atrocities, most notably against the Yazidis of Sinjar.

Fighting between the YPG and ISIS had already started before the founding of the Caliphate. Sweeping north and westwards from Deir ez-Zor, ISIS captured huge areas of Syrian territory, stretching from the Turkish border in the north to the government strongholds in the east. Surrounded by this 'black wave' were the Kurdish-controlled areas of Afrin and Rojava.

The Syrian Democratic Forces

As the counter-offensive to push ISIS out of the territories it had conquered in Syria took shape over the first six months of 2015, the YPG was faced with the reality of moving into areas with Arab majorities. Several tribes and factions had already sided with the YPG in the early battles against ISIS – and a joint operations command had evolved from these early efforts at coordination, *Burkān al-Furāt* (Euphrates Volcano). With their offensives into new territory, the expansion of this alliance structure into a formal organization that represented the more cosmopolitan and diverse makeup of the ethnicities which had built an alliance against ISIS had become highly desirable.

There were also outside political factors. As support from the United States and the international coalition grew for the Kurds and Euphrates Volcano, so did complaints from Turkey. With the close ideological links between the YPG and the PKK, the Turkish government began to make loud protestations about the support rendered to the Syrian Kurds, whom they branded terrorists. A reconstitution and renaming of the anti-ISIS and pro-western forces in Syria was, therefore, an imperative in the war against the Caliphate.

On 10 October 2015, Euphrates Volcano was replaced with a more formal alliance structure, *Hêzên Sûriya Demokratîk* (the Syrian Democratic Forces, SDF). This organization was intended to allow the diverse ethnicities and religions of Syria to work together in a unified command and operational structure, but without absorption into a completely unified entity, which would be required by the armed forces of a state.

The SDF was formed of Kurdish, Arab and Christian Syriac militias, but did include smaller groups of Armenian and Turkish forces. Its primary goal was the creation of a democratic, secular and decentralized Syria. Its flag is seen here flying over the settlement at al-Baghuz on 24 March 2019, the day after the SDF declared victory over the remnants of the Islamic State, close to the Iraqi border in the Deir ez-Zor Province. (GIUSEPPE CACACE/AFP via Getty Images)

The primary component of the SDF would remain the Kurdish YPG, as it was the largest group in the alliance; but, by March 2016, the White House had declared that the SDF '… has transformed from a primarily Kurdish force to a group that is 40 percent Arab, Assyrian, Christian, and others'. The SDF would become the primary land force in the war against ISIS in Syria, supported by an international coalition headed by the United States, which was to provide air strikes as well as logistical support, special forces teams and training to the SDF. This new phase saw the mobile forces of the YPG revitalized, and then expanded, as foreign military aid provided new vehicles and allowed for the refurbishment of the older vehicles the SDF had relied upon up to that point. Nonetheless, political considerations vis-à-vis US–Turkish relations prevented any heavy armour being supplied to the Kurds. By necessity, the SDF had to continue to rely on captured tanks and duşkas as its primary fire support element in ground operations.

The integrated command structure allowed the international coalition to provide greater ground–air coordination in the campaigns being fought in Iraq by government forces and the local Kurdish Peshmerga forces. It likewise facilitated some informal cooperation between Russian support teams and the SAA in their own war with ISIS in the west and south of Syria. This assisted in the reduction of friendly fire incidents, which were a serious problem, given the multitude of different factions fighting in the country.

IMPROVISED ARMOURED FIGHTING VEHICLES

With its roots as a local militia with not much more than a light infantry capability, the early YPG was very much enamoured with the possibilities of IAFVs. As modern anti-tank weapons were relatively sparse in its zone of control, and the enemies it was facing still lightly armed, at least until ISIS secured a huge haul of weapons in Mosul in June 2014, this was understandable. A single AFV could make a significant impact upon any of the skirmishes for small towns and hamlets in which the YPG found itself prior to the big ISIS push north in 2014.

Improvised Armoured Fighting Vehicles were built by all the main factions in the Syrian Civil War (SAA, FSA, ISIS, SDF). One of the authors poses in front of a captured ISIS vehicle, Serê Kaniyê, July 2015. AFVs like this would be repaired and added to a force's inventory whenever possible. (Ed Nash)

The building of IAFVs has a history stretching back over a hundred years. The reasons are always the same: a force composed primarily of infantry facing similar opposition recognises the value armoured vehicles provide as force-multipliers – even if they are unsophisticated and only available in small numbers. Armament is generally limited to machine guns, although here the availability of heavier military weapons meant that some of the Kurdish IAFVs sported surprisingly impressive firepower. The style of vehicle followed a predictable pattern, with a large civilian wheeled vehicle (such as a lorry or rubbish-disposal vehicle) or agricultural machine using caterpillar tracks, used as a base, then an armoured box created around it with whatever sheets of metal were available. Similar attempts to create IAFVs can be observed on the part of the FSA and ISIS in the early stages of the conflict, although the YPG was most successful in its construction activities.

The machines they built were named *panzers* by the Kurds and came in a myriad of shapes and sizes, each being an individual creation of the workshop and mechanics who built them. A common phenomenon in this field of 'armoured warfare' was the capture of IAFVs from an opposing side. Both the YPG and ISIS captured some of their opponents' vehicles; these occasions were frequently exploited for propaganda purposes, with smiling fighters filmed clambering over their newly acquired war booty.

These conversions, though very much a desperate measure to get some type of AFV into YPG units, saw a great deal of service during the fighting with al-Nusra and ISIS in 2013–14. They were slow and lumbering, however, and the prevalence of anti-tank weapons such as RPG-7s in ISIS hands made using them highly risky. At least one foreign volunteer was killed while crewing such a vehicle in combat in March 2015.

Improvised tanks

Among the early creations were several large vehicles, dubbed 'Sandcrawlers'. These were based on large industrial bulldozers or diggers, in other words, a chassis with caterpillar tracks, covered in large sheets of steel plate. With a V-shaped nose at the front, turrets added, and mounting 7.62mm and/or 14.5mm KPV machine guns, some versions included firing

ports for infantry travelling inside. The armour plate varied between 5 and 10mm; speed was somewhere between 5 and 20mph, depending on the terrain. At least three of these machines could be observed operating together with duşkas in the first half of 2014. The high profile and bulky, box-like form remind one of the German A7V tank from World War I. At least one of these machines was filmed by ISIS, having been disabled in the fighting in Kobanê in late 2014. The value of the Sandcrawler was in transporting infantry across open ground when faced with lightly armed forces. Much of northern Syria consists of flat, open ground, with little natural cover, so that fighting often revolved around assaulting buildings, which made up hamlets or small villages.

Smaller versions of the original Sandcrawler concept were, likewise, based around an agricultural caterpillar chassis. But in these 'versions', constructions unique to each 'tank', which began to appear around early 2015, the welding work was more sophisticated. In the case of one improvised tank (pictured in Plate B1), the sides of the caterpillar track were almost completely covered, while the hull sides featured two sheets of steel, both angled outwards; thus, there was some chance of deflecting incoming small-arms fire. The nose of the vehicle was pointed in a more pronounced fashion than the original Sandcrawler design, while the home-made turret was more sophisticated. The main armament, mounted in the turret, was a .50 calibre (12.7mm) machine gun; the armour thickness ranged between 5 and 15mm; the speed varied between 5 and 30mph.

In another version of the basic concept, based on a caterpillar vehicle of a similar size, the armament was a twin KPV 14.5mm anti-aircraft machine gun. It was mounted in a turret, probably taken from a knocked-out BTR-60 armoured personnel carrier (APC).

Improvised armoured cars

Another common conversion was to take readily available vehicles like the Toyota Hilux or Land Cruiser and convert them into light-armoured cars. These hark back to the first such vehicles to be built in large numbers in World War I. Mobile, reliable and fitted with machine-gun turrets, and enough armour to protect the crew from small-arms fire, these vehicles were a useful addition to the fleets of the YPG and SDF. At least one of these armoured cars took part in the fighting in Kobanê in late 2014, providing fire support through a machine gun mounted in a turret. They were also used to transport infantry. One of the features common to some of these

B

IMPROVISED TANKS

These two improvised tanks, armed only with machine guns, demonstrate the unique 'design' of each of these machines. At the same time, they illustrate equally the variety of camouflage patterns employed by the YPG. These 'second-generation' IAFVs were probably completed in early–mid-2015.

1. Ram tank with turret. This IAFV features a machine gun mounted in a crudely constructed home-made turret, slanted armour plates on the sides and a pointed nose at the front. Judging by the scraped metal on the nose, and the damage to the camouflage pattern, this vehicle was used on at least one occasion to break through a wall. A vision hole, complete with a sliding, protective cover, added to the front, gives the driver better visibility when not under fire.

2. Ram tank without turret. This DIY tank, built around a digger chassis, is a cruder affair. It is equipped with a machine gun in the hull, while the battering-ram nose has been reinforced with heavy steel plates, probably cut from the remnants of a tank or an APC employed by ISIS.

1

2

Following behind a 23mm duşka, this smaller IAFV was a design which proved more useful in the long run to the SDF. More mobile than the improvised tanks, armoured cars had the ability to move quickly around the operational area under their own power. Based on vehicles like the ubiquitous Toyota Hilux, they proved reliable and easy to maintain, with spare parts readily available. Ironically, if the 'tank' IAFVs bore some resemblance to their World War I precursors, these armoured cars were reminiscent of the British Rolls-Royce armoured car in 1914 – light armour, a turret and armed with a machine gun. (DELIL SOULEIMAN/AFP via Getty Images)

improvised armoured cars was the steel plate added in an attempt to provide some protection for the tyres, which were an obvious point of vulnerability.

Improvised armoured support vehicles

The Kurdish talent for improvisation can also be seen in ingenious forms of armoured transportation. In one case, in what appeared to be a modification of a rubbish-disposal lorry, armour plate was added to protect the driver's compartment, complete with a small vision-slit; film footage shows the vehicle with a machine gun mounted in a crude turret on the roof. It features the same V-shaped form at the front that was employed in the Sandcrawler tanks, but with the addition of the face of a wildcat painted on the front. In contrast to this unique IAFV, a more common support vehicle was the armoured bulldozer, essential in urban warfare.

Two further IAFVs provide examples of the way in which these vehicles could play a significant part in the propaganda war. An APC, filmed just after the expulsion of ISIS from Kobanê at the end of January 2015, was suggested in western reports to have been a Kurdish construction, complete with metal piping, sawn in half, as add-on armour. Other photographic material, however, indicates it was very probably captured from ISIS, repaired, then pressed into YPG service. The opposite fate was met by a YPG armoured

C

'WILDCAT' ARMOURED PERSONNEL CARRIER

The armoured plate added to what was most likely a rubbish-disposal lorry indicates it was probably constructed around the same time as the first series of Sandcrawler tanks (late 2013–early 2014). The driving compartment of the lorry has been completely surrounded with sheets of metal, with a vision hole cut into the front to allow the driver to see enough to steer. The steel plate on both the front and the sides covers about five-sixths of the wheels; although this may have provided greater protection for the most vulnerable parts of the vehicle, it would have restricted movement to roads. A simple form of dazzle camouflage (comparable to the pattern used for YPG uniforms) has been used along the sides of the vehicle. But this would have had little practical function, given the wildcat face painted on the front of the vehicle which suggests that morale was one factor behind the construction of this IAFV.

Assisting mobility in rubble-strewn streets, this conversion of a wheeled bulldozer, in Kobanê, July 2015, retained its blade and acted as an armoured engineering vehicle, but also as a fighting platform. Hastily throwing up fortifications using diggers such as this one was a key YPG/SDF tactic, particularly later in the war as the danger posed by ISIS suicide vehicles became the primary threat during offensive operations. As a result, some armour for these vehicles was not unusual, as they often carried out their work under fire. (Ed Nash)

bulldozer in Kobanê in 2014. A conventional digger, but with an armoured infantry compartment added, it was captured by ISIS, then filmed as war booty, with the images posted online.

Improvised armoured personnel carriers

With equipment so sparse, nothing was wasted. Captured or damaged vehicles would be stripped down and, where possible, refurbished. For example, it is known that the SDF made at least two tracked APCs – designated 'BMB' – using mainly salvaged components, which were configured according to lessons from SDF combat experience.

This experience in construction, combined with access to parts from purpose-built machines, meant that later construction and modifications made these later panzers considerably more useful than their predecessors, enjoying much better battlefield mobility and firepower over the earlier 'models'. Although they had essentially served their purpose in the YPG once

A truck converted into an APC transports YPG infantry in the aftermath of the battle of Kobanê, February 2015. The vehicle has been given a high front, sloping backwards, both to deflect small arms fire and to protect the driver. Although it was carrying YPG fighters, the evidence suggests that the vehicle was captured from ISIS during the fighting in Kobanê; the use of metal piping could be seen on other ISIS IAFVs. (Murat Bay/Corbis via Getty Images)

better AFVs became available through capture or from the coalition, these improvised vehicles were later distributed to allied units within the SDF. This allowed other units to create their own armoured forces and learn their own techniques in mechanized warfare.

The mobile campaigns fought by the YPG and SDF from late 2015 onwards required much more mobility than many IAFVs were capable of providing. In addition, the open plains of Syria, the presence of anti-tank missile systems in ISIS hands and the lumbering nature of the early conversions, particularly the tracked models, made their employment highly risky. By the time of the battle of Manbij (June–August 2016), most IAFVs were still deployed on operations, but were held as a reserve for use only if necessary. But the small numbers of AFVs available to the SDF provided an additional motivation to keep hold of even the crudest of vehicles.

A former Iraqi Army MTLB in Serê Kaniyê, September 2015, flying the flag of the YPJ, although the crew member visible is male. This APC has had additional storage boxes added to the roof of the vehicle and it has been painted in a mottled 'lizard skin' pattern. Note the added turret with a covered weapon, probably a 12.7mm or 14.5mm heavy machine gun. The summer and autumn in northern Syria are very dry and the arid landscape throws up clouds of thick dust when driving cross-country. Any vehicle crew would take measures to protect their weapons in order to minimize the need for cleaning. (Ed Nash)

This T-54/55 tank has lost its turret, but it has still provided a chassis for the creation of an APC. The YPG successfully added a new custom-built turret fitted with a W-85 heavy machine gun, and reinforced the glacis with a pointed nose, possibly for smashing into buildings with ISIS fighters inside – a tactic which had some success. Serê Kaniyê, September 2015. (Ed Nash)

A T-55 tank flying the flag of the Manbij Military Council, part of the SDF, engages ISIS forces during the drive for Manbij, June 2016. Vehicles like this would often go through SDF workshops, receiving refurbishment and upgrading, making many unique in configuration and paint schemes. This tank has been given a cupola-mounted Chinese-made W-85 heavy machine gun with an armoured shield. (Ed Nash)

AFV SOURCES: SYRIAN ARMY, ISIS AND COALITION-SUPPLIED

The changing fortunes of war, first for the YPG, and subsequently for the SDF, meant that the vehicles they used changed and improved as the struggle against the Islamic State unfolded. But providing accurate figures on exactly what the YPG and SDF were able to deploy is not possible to any degree of accuracy. AFV combat losses, captured vehicles, as well as the unwillingness of outside powers such as the United States to offer information on what equipment they supplied to their coalition partners, means that the true numbers and all the AFV types used is unlikely to be known for many years.

With its long history of wars with Israel and neighbouring Arab states, as well as its decades-long status as a critical Soviet – then Russian – ally, the Syrian Army was for years disproportionately large for the size of the country. It was lavishly equipped, with huge quantities of reserve war material in warehouses. When the civil war erupted, large quantities of these weapons fell into the hands of different militias.

While the YPG was not able to acquire as much of this hardware as other factions, its initial source of tanks and military armoured vehicles was the Syrian Army. When the YPG began its rise to prominence in 2012, an uneasy truce formed between it and local Syrian military units. Some Syrian forces, such as those in the city of al-Hasakah, remained in control of districts where local support was on the side of the regime.

D

IMPROVISED TANK WITH 73MM CANNON

This improvised tank has been built on the chassis of a D4 tracked digger or bulldozer manufactured by the US Caterpillar company. The positioning of the front wheel of the original vehicle at the back of the tank indicates that the engine is housed to the rear of this IAFV. Film footage released by the YPG Media Center indicates it was employed in attacks, together with other YPG AFVs, in northern Syria in mid-2015. The welding and construction work shows a clear improvement over the Sandcrawler tanks. The improvements in IAFVs were most likely a result of greater availability of the remnants of ISIS-crewed tracked vehicles. The most interesting features are the turret (most probably salvaged from a knocked-out ISIS BMP-1), the slanted armour on the hull, designed to deflect incoming small-arms fire and RPG warheads, and the pointed nose, used to help the tank punch through walls.

For many units across the country, however, the reality was that they were cut off from any support from Damascus. The rise of the Islamist groups, especially al-Nusra and ISIS, which expressed the desire to eradicate any remnants of the regime, meant that these units faced stark choices: attempt to hold out until relieved (like the Kuweires air base), switch sides and join the Islamists or else negotiate safe passage through to government-controlled zones. Several garrisons negotiated such deals with the YPG. In most cases, heavy equipment was left behind, or even willingly handed to the YPG on occasions, as it was understood that it would be used against their mutual enemy – the Islamic State. While much of the equipment was largely obsolete Cold War-era material, it still provided the YPG/SDF armoured forces with their most robust tanks and AFVs.

Soviet armour

The Soviet T-54/55 was the most numerous tank type in Syrian service at the start of the war and, hence, was employed by all the major factions during the conflict. The USSR and Warsaw Pact nations exported around 20,000 between 1950 and 2000, including to Syria and Iraq (see New Vanguard 102: *T-54 and T-55 Main Battle Tanks 1944–2004*). Some of the Iraqi tanks fell into ISIS hands in 2014 and found their way to Syria. Thus, YPG T-55 tanks (it is unlikely that many T-54s survived the various wars conducted by Syria and Iraq) came from SAA stocks or were captured from ISIS (and so were from Iraqi Army stocks). It is thought that, in total, only a dozen or so tanks were in use with the SDF in the war against ISIS. Some T-55s may have been taken from the Syrian Menagh Military Airbase near Afrin on 10 February 2016 when Kurdish forces captured it from the al-Nusra Front. Given the lack of spare parts, and maintenance problems, the tanks were mainly used for the firepower offered by the 100mm gun, as well as their propaganda value.

A surprisingly rare example of a largely unaltered T-55 in YPG service, the only addition being a painted YPG identification badge. Most such tanks would be fitted with armoured shields for the pintle-mounted machine gun, in this case a DShK. This vehicle had probably seen action shortly before this photograph was taken, judging by the discarded shell cases. Al-Hasakah district, March 2016. (Ed Nash)

A BRDM-2 crew await orders outside Raqqa, February 2017. This vehicle has been modified with a new turret, storage bins and what appear to be metal rods added as appliqué armour. It has also been fitted with a hinged armoured flap to protect the front tyre. Additional added armour to protect tyres was a common feature among all types of YPG/SDF wheeled vehicles. (DELIL SOULEIMAN/AFP via Getty Images)

There are reports that two to four T-62 tanks, the successor model to the T-54/55 series, were captured from ISIS in the Al-Hasakah Governate. There is no evidence of their employment in combat, probably because they were in too poor a condition to be genuinely battleworthy. There is evidence, though, that the YPG made use of at least three T-72s; one was used during the northern Aleppo offensive in 2016, one was destroyed by a Saudi-sponsored faction in the FSA, and at least one was operated by a YPJ crew. The T-72s were fitted with a form of cage armour to offer some protection from shaped-charge warheads.

One ZSU-23-4 tracked anti-aircraft AFV was captured at the Tishrin Dam in late December 2015, then appeared in news reports on the Raqqa Campaign in 2016/17, although it is not clear whether it was used in combat or simply paraded before the cameras.

BRDM-2 scout vehicles

The YPG and SDF were in no position to ignore any vehicle that they could possibly acquire and return to working order. Thus, anything which had been in the Syrian Army's inventory at the start of the civil war in 2011 was liable to be pressed into service. It is certain that at least two BRDM-2 scout vehicles were repaired by the SDF. These had been used by the SAA in some numbers previously, but they had been retired from front-line service before the civil war. With good cross-country mobility, armour and turreted armament, they acted as useful fire support weapons – effectively armoured duşkas – and were in front-line use certainly at the time of the fall of Raqqa in 2017.

Armoured personnel carriers

The BMP-1 Infantry Fighting Vehicle was the standard APC of the Syrian pre-war armoured units. Capable of carrying a three-man crew and eight infantry, and well-armed with a 73mm cannon, coaxial machine gun and, generally, an anti-tank missile launcher, the BMP-1 was a revolutionary vehicle when first fielded in 1966. While highly vulnerable to modern anti-tank weapons,

While they saw limited service, BMPs were useful for the few armoured attacks the YPG conducted. This BMP-1 is parked in front of al-Shaddadi Hospital after the fall of the town, February 2016. APCs would normally be used in sudden attacks, rushing in to deposit the infantry they carried, then beating a hasty retreat to avoid possible incoming anti-tank fire. As many infantry fighters as possible would be crammed into the vehicles. (Ed Nash)

it still proved a valuable tracked vehicle in what was a light infantry war; and, on paper, it appeared an ideal APC for the YPG, with its good cross-country performance and reasonable level of armour and armament.

Along with tanks, the Syrians had imported thousands of APCs in the previous decades, the vast majority from the Soviet Union during the Cold War. Most of these remained with the regime forces, were seized by the Free Syrian Army, or else fell into the hands of ISIS or other groups, such as al-Nusra. Still, a handful made their way into service with the YPG and, subsequently, the SDF. In fact, very few were captured by the SDF in working order, although the ones that were available were put to good use. In addition, the turrets from destroyed vehicles were used widely on improvised tanks; and salvaged or modified hulls were used to produce the home-made BMBs.

Several Soviet MTLB APC were employed by the YPG/SDF, at least one of which had a new turret fitted. Alongside the BMBs, these proved extremely valuable, although at least one was destroyed when it hit a mine. Captured from ISIS, which in turn had looted them in Iraq, then transferred them to Syria, these vehicles were greatly valued by the YPG for their excellent cross-country capability and troop-carrying capacity. Invariably they were fitted with an armoured heavy machine gun to be able act as, in effect, tracked duşkas.

The MTLBs were often the favoured vehicle when the SDF launched rapid attacks against ISIS positions. The standard tactic was for the APC to rush the target, disgorge the troops, then retire as quickly as possible to protect

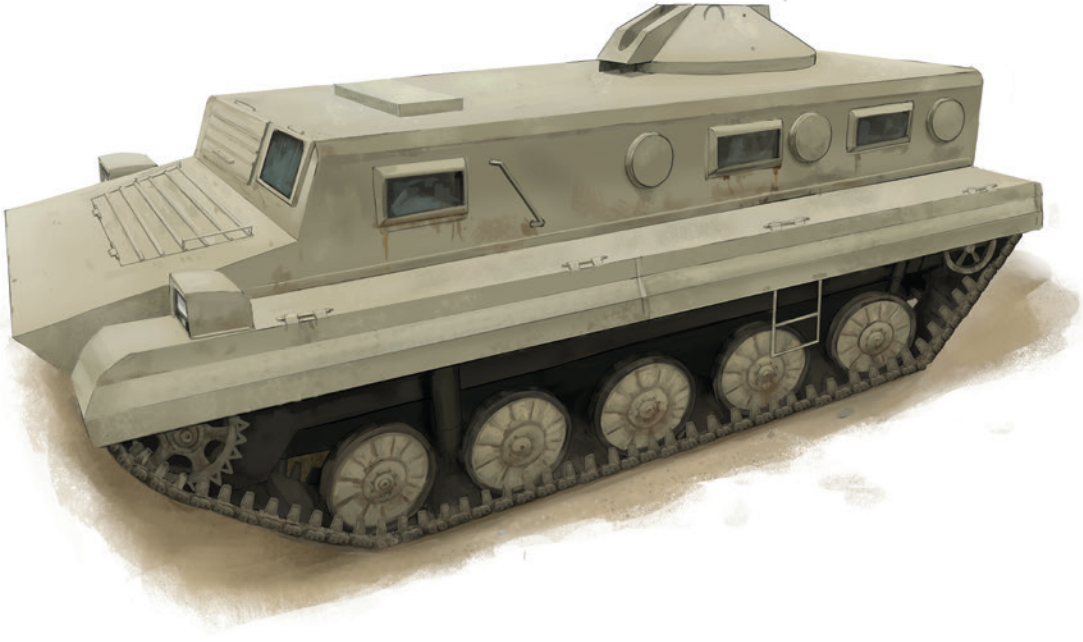
E

ADAPTED RUSSIAN ARMOUR

1. BMB armoured personnel carrier. This BMB IAFV was first observed in Qamişlo in early 2019, so there is no evidence it was ever employed in combat before the defeat of ISIS ground forces. The significance of this APC is the way in which the original BMP-1 road wheels, engine, tracks and shock absorbers have been combined with parts from BTR-60 and BRDM vehicles, as well as some home-manufactured components. The turret was probably taken from a BTR-60.

2. T-72 with cage armour. By early 2017, an estimated 19 T-72 tanks had been captured by ISIS, with a further eight in the hands of other rebel groups, so the number captured by the YPG/SDF is unlikely to have been much higher than the three known with certainty to have fallen into their hands. It is unclear as to whether the cage armour on this T-72 was already fitted at the time of its capture in 2016; although cage armour added to SAA tanks was uncommon at the start of the conflict, the first examples were spotted in 2014.

1



2

the precious vehicle. The MTLBs, fast and with a low silhouette, performed this role better than other vehicles available to the SDF, certainly up until the acquisition of new equipment from the coalition in 2017.

Several BTR-60 eight-wheeled armoured cars were among the first robust APCs to be employed by the YPG. These had been retired by the Syrian Army a few years previously, hence were either sitting in junk yards or else in use as static guard posts at army facilities when the war broke out. Other factions did not consider these hulks worth the effort of rebuilding, but, with its chronic initial shortage of AFVs, the YPG could not afford to pass up the opportunity. A number were recovered and repaired, sometimes requiring considerable modification to accommodate new and non-standard engines, and often being fitted with additional armour. These vehicles served through the early desperate months of the war with ISIS, although they were gradually destroyed or retired as newer vehicles became available.

M1117 armoured security vehicle

Among the oddities captured from ISIS that were pressed into service was at least one American-built M1117 security vehicle, in use with the YPG as early as 2015. It was part of the vast haul of booty ISIS had taken from the Iraqi Army in 2014. This would provide stalwart service as a YPG APC; it was fitted with a 14.5mm KPV and a gun shield.

The US Army Humvee

According to press reports, the Iraqi Army lost 2,300 Humvees to ISIS in June 2014, many of which were subsequently employed in Syria. Hence, the most important of the vehicles captured from ISIS in 2015 were, arguably, several of the armoured US HMMWV (High-Mobility Multipurpose Wheeled Vehicle) Humvees (see New Vanguard 122: *HMMWV Humvee 1980–2005: US Army tactical vehicle*). These modern descendants of the famous American Jeep used in World War II were initially grouped into dedicated units rather than parcelled out among the various heavy weapons *taburs* (platoons). An obvious example is Tabur Soran of the YPG's Mobile Brigade. This unit was employed in assault, personnel carrier and armoured ambulance roles on many of the early anti-ISIS operations after the relief of Kobanê.

A YPG gunner before engaging in an anti-ISIS operation, Abdul Aziz Mountains, October 2015. The single-barrelled KPV is fitted with a locally made shield and is mounted on a Toyota Hilux. In the foreground, the turret of one of the armoured Humvees of Tabur Soran can be seen; behind the duşka, there is an MTLB flying the flag of the YPJ. The similar construction and camouflage scheme on the duşka suggest this vehicle was built or converted by the same workshop as the YPJ vehicle shown in the photograph on page 8. (Ed Nash)
Tabur Soran was one of the prime strike forces in the YPG and SDF. In September 2015, it featured a substantial number (possibly all) of the armoured Humvees available to the YPG at that time – a total of six, of which only four were in running order. This unit was especially popular with foreign volunteers in the first two years of the civil war, since transfer to it guaranteed being in the thick of the action.

An American YPG volunteer greets one of the authors from the turret of an armoured Humvee. The 'rough handling' these vehicles received in combat is all too apparent. This vehicle does not have a fitted weapon; instead the gunner used a PKM machine gun or a Kalashnikov rifle propped on the gun shield, or fired through the gaps in the armour. Abdul Aziz, October 2015. (Ed Nash)

As support from the international coalition increased and new parts were supplied, the old vehicles were rebuilt into virtually new vehicles. According to some reports, the SDF received over 20 Humvees from the United States in 2017 as part of a military support package (exact numbers were never revealed owing to political complications with Turkey). These were equipped with a US .50-calibre (12.7mm) machine gun, issued with a shield, as well as an additional shield, fixed around the open ring on the roof of the Humvee, protecting the sides and back of the gunner. Some versions had an additional metal plate fixed over the head of the machine gunner to deflect grenades thrown from buildings. A further addition was a steel plate mounted at the front to protect the engine. The SDF sometimes added further steel protection around the front of the vehicle. The increased numbers of Humvees revitalized the SDF armoured corps; they went on to provide sterling service in the fight for Raqqa and thereafter.

The difference American supplies made to the quality of SDF armoured units can be deduced from this shot of an armoured Humvee taken during the battle of Raqqa, August 2017. The Humvees delivered in 2017 were probably the M1114 UAH version of the vehicle. Although the exact quantity is still not known, sufficient numbers of this Humvee type were supplied for them to become the main armoured vehicle in use with the SDF in the final 18 months of the conflict. (DELIL SOULEIMAN/AFP via Getty Images)

Other US-supplied wheeled vehicles

In addition to armoured Humvees, other vehicles were supplied by the US-led coalition to the SDF in 2017. The first delivery consisted of an undisclosed number of IAG Guardian, four-wheeled APC. According to the Stockholm International Peace Research Institute (SIPRI), only five of these vehicles were ever supplied to the SDF, although it is possible higher numbers were sent. Announcing the delivery of substantial numbers of vehicles would have severely damaged US–Turkish relations.

Made in the UAE, the Guardian is built with commercially available Ford components and fitted with an armoured body, resistant against small-arms fire and explosions. Capable of carrying up to ten troops and two vehicle crew, the Guardians, despite their small numbers, provided the SDF with a reliable, fast and responsive armoured vehicle, and one which was able to resist the significant level of blast caused by roadside bombs. Their speed, reliability and mobility allowed them to perform transportation missions to the front lines, moving troops and allowing the offensive tempo to be raised.

In August 2017, a vehicle with similar capabilities in terms of speed and protection was delivered to the SDF – the American-built Lenco BearCat. SIPRI reported only two of these four-wheeled vehicles delivered, although again the actual number may have been slightly higher. But with similar performance and capability to the Guardian, these vehicles will have been greatly valued for their speed, capacity to carry ten soldiers (plus two drivers) and resistance to blast and small-arms fire.

'TECHNICALS'

Known in western military parlance as 'technicals', duşkas made up the most numerous and important part of the YPG/SDF fighting vehicle fleet. Normally a crew-served weapon mounted on a civilian vehicle chassis, this type of

IAG Guardians provided a greatly needed boost to the SDF's armoured fleet. New, fast and reliable, they were highly appreciated by the SDF soldiers. Note that although brand new, this vehicle still appears to have been modified, with an armour cover added to protect the top half of the rear tyres. This is another example of a typical modification for vehicles that went through YPG/SDF workshops. Near Raqqa, February 2017. (DELIL SOULEIMAN/AFP via Getty Images)

The gunner of a duşka armed with a Russian 12.7mm DShk machine gun carefully lays his weapon. This is probably one of the earliest duşkas made by the YPG, since weapons of this type were normally mounted on armoured vehicles. The chassis appears to be a Chinese-built Great Wall Deer pick-up (very similar to the sixth generation of the Hilux), a common civilian vehicle in Syria at the beginning of the war, although it was soon outnumbered by Land Cruisers and the Toyota Hilux. Battle of Al-Hawl, November 2015. (Ed Nash)

improvised system has a long history. These simple weapons have become a standard feature in many irregular and poorly equipped forces where their combination of low cost, ease of use and maintenance and heavy firepower provides a highly efficient mobile weapons system. They have been a standard feature in the armies of guerrilla and insurgent armies, as well as western Special Forces, for decades (see New Vanguard 257: *Technicals: Non-Standard Tactical Vehicles from the Great Toyota War to modern Special Forces*).

In contrast to some other users of the IAFVs, who often employed them as an assault vehicle, the YPG/SDF used the duşka as a fire support vehicle. Owing to the scarcity of indirect fire support weapons in their arsenal, as well as an initial limited knowledge of how to use such weapons effectively, both the YPG and SDF relied on this type of weapon to provide long-range suppressive and destructive fire on targets.

While western air strikes, primarily from the United States Air Force (USAF), provided the SDF with their most effective and devastating form of fire support, these required approval from US commanders, who were not present on the battlefield. Moreover, they were subject to careful oversight in order to minimize civilian casualties. On occasions, this meant air support was reduced owing to political considerations, which had nothing to do with the fighting in northern Syria. An example of this was the accidental bombing of a *Médicins Sans Frontières* hospital in Afghanistan by the USAF, which led to an initial and substantial reduction in air support during the Al-Hawl Campaign in November 2015. Air strikes were also dependent upon the availability of aircraft.

Thus, although offering less firepower, duşkas still provided SDF commanders on the ground with their primary fire support for softening up targets and for responding to ISIS actions at short notice. Duşkas were constructed at YPG/SDF facilities throughout Rojava and northern Syria, with production taking place at most major towns with appropriate facilities; the surrendered government facility in the town of Rmelan, and the major YPG base at Tell Tamer, were prime examples.

Wherever possible, duşkas would be armed with captured or salvaged anti-aircraft guns that would be mounted straight onto the loading bay of

a vehicle. The YPG/SDF would also prove adept at building breeches for single-shot weapons that they would marry up with captured stocks of spare barrels, producing, in effect, light truck-mounted cannon. Probably the most frequently used vehicle was the Toyota Hilux.

The YPG/SDF method for using duşkas was also rather particular. Automatic fire was frowned upon throughout the force, to the extent that infantry machine gunners were taught to fire single shots from PKM machine guns, something that required quite a bit of practice, as this gun does not have a single-shot feature. The reason for this was that commanders in the YPG, and later the SDF, believed in the use of accurate, ranged targeting to fulfil the role of suppression rather than drenching a target in automatic fire.

In the case of duşkas, the recommendation for long-range single-shot accuracy was even more emphatic. Hosing a target with fire was a tactic used occasionally, but it was generally regarded as a waste of ammunition. Instead, YPG/SDF crews would carefully aim each shot, adjusting their fire until they started to hit the target they were aiming at as precisely as possible.

Such techniques would often mean the vehicle was kept some distance from the target, often over 1km for lighter weapons, such as heavy machine guns, to more than 3km when using heavier cannon. Given the flat terrain, which characterized most of the region where the YPG/SDF–ISIS conflict took place, the ability to deliver long-range, direct fire was an important capability.

Use of tracer ammunition was the norm, and fire would be directed by a spotter equipped with binoculars who would call fire adjustment to the gunner. Such was the finesse expected that the gunners would often adjust their weapons with slight taps from the flat of their hands to correct their aim. As is easy to imagine, duşkas came in a huge array of models, with many being unique, since they were dependent on the available weaponry and vehicle chassis. Rather than being categorized by the vehicles that acted as the gun platform, duşkas can be thought of more usefully in terms of the weapons they mounted.

12.7mm heavy machine guns

The lightest and easiest to construct of all the duşkas carried a 12.7mm machine gun fitted on a stand on the back of a light truck: they were built using either a Russian-origin DShK, or a Chinese W-85, both of which were chambered in 12.7×108mm. However, these types were rare, as it was preferred to mount such weapons on other vehicles in armoured mountings. It was usual for tanks and personnel carriers to receive such a fitting, allowing them to provide a broader range of firing options in combat, and the ability to act as a form of armoured duşka, if required.

Later in the war, supplies of American Browning .50-calibre (12.7mm) heavy machine guns were used, mounted on Humvees supplied by the United States in time for the battle of Raqqa in 2017.

14.5mm KPV

The most popular duşkas constructed and employed by the YPG/SDF were those based upon the Soviet KPV anti-aircraft machine guns. An old design, large numbers of KPVs and spare parts seem to have fallen into the hands of the YPG early in the war, probably by seizing them from warehouses

A Toyota Land Cruiser with a ZPU-2 twin 14.5mm anti-aircraft gun system mounted on the loading bay, Tell Tamer, October 2015. It has been fitted with an armoured shield to provide some protection for the crew. Capable of a cyclic rate of 1,200rpm, when in full-automatic firing mode, it would never be used in such a way by the YPG/SDF, except perhaps in panic, as the lack of stabilizers on the vehicle would make for a very shaky firing platform – and would also waste ammunition. (Ed Nash)

holding equipment held for reserve units of the SAA. Certainly, pictures from the battle of Kobanê in 2014 show at least one 14.5mm duşka in use there.

The duşka was popular with the YPG/SDF, and no doubt with other users, because the 14.5mm round used by this weapon has a very high velocity and a flat trajectory. Given the SDF's emphasis on accurate, well-placed fire, this weapon met its needs perfectly, being capable of surprising levels of accuracy at 3km, with the capacity to extend its range even further if necessary.

In addition, the 14.5mm bullet was originally designed as an anti-tank projectile during World War II. The projectile is not capable of penetrating modern tanks, yet it is still highly effective against soft-skinned and lightly armoured vehicles, such as the suicide vehicles that were commonly used by ISIS.

This capability also meant that the 14.5mm duşkas were able to punch effectively through the walls of the houses that ISIS fighters were using as fighting positions. While many modern houses in Syria are built of hollow concrete blocks, most houses in the region – especially in the villages that dot the plains and rolling hills of northern Syria – still tend to be made of mud brick. While these are extremely resilient to gunfire, the 14.5mm was one of the more effective projectiles for dealing with these targets.

In terms of construction, multiple variants were built. If a complete anti-aircraft mounting of the ZPU-series was available, these would be fixed directly onto a truck bed to provide a straight-forward conversion. It was more common, however, to see these weapons mounted in single configurations on custom-built mounts constructed in YPG/SDF facilities.

23mm cannon

The ZU-23-2 system was the standard anti-aircraft cannon used by the Syrian Army before the war; and many ended up in the hands of the YPG and other groups. As a result, the 23mm duşka has been common on all sides: its combination of a high rate of fire and explosive shell have proven an extremely effective anti-personnel weapon. For the YPG/SDF, the explosive effect of the 23mm shell was valued for specific circumstances, but more as

Weighing in at just under a tonne, this ZU-23-2 23mm twin anti-aircraft cannon is about the maximum specified capacity for a Land Cruiser. With a rate of fire of around 2,000rpm, such a weapon was extremely inaccurate in full-automatic firing mode, thus reinforcing the belief in the SDF tactic of using these weapons to fire single shots. Manbij, June 2016. (Ed Nash)

an area weapon and 'house buster' than for its accuracy. In this regard, the 23mm was considered inferior to the 14.5mm, likewise in its anti-armour capability.

A graphic example of this was witnessed by one of the authors when he was part of a column that was attacked by an ISIS vehicle-borne improvised explosive device (VBIED) on the drive to Manbij in 2016. YPG 23mm duşkas stopped the armoured bomb in its tracks, yet they were unable to penetrate or destroy it. This led to a rapid flight into the surrounding hills by the whole battle group until a coalition airstrike could be called in to deal with the threat.

57mm recoilless rifles and multiple rocket launchers

At least one S-60 57mm anti-aircraft gun was mounted by the SDF on a truck chassis to form what must have been a very hard-hitting duşka. This could be seen in footage taken by the SDF in 2016. Recoilless rifles and multiple rocket launchers (generally light 107mm models) were also used whenever they were acquired and would be mounted on the ubiquitous Toyota Hilux or Land Cruisers to provide additional mobile firepower. Like the duşkas, they would be used to provide direct fire support, although at range in order to protect them from return fire. Numbers were limited and results could be erratic, no doubt owing to limitations in training.

UNIT STRUCTURE AND TACTICS

The YPG, and later the SDF, were essentially built around two specific force structures – the tabur and the brigade. The tabur was the principal unit of the SDF, ranging in size between a platoon and a company. These normally ran under two names: one official, that of a martyr of the fighting, and the common one which was the name of the unit's current commander, by which it was usually known.

Taburs were allocated a role, which contributed to the size of the unit. Specialist taburs, such as an anti-tank unit, could number less than ten

fighters. Sniper and sabotage (which combined a commando with an Explosive Ordnance Disposal role) tended to be small units because of their 'elite' status.

The majority of taburs were infantry units; these generally numbered between 20 and 40 soldiers. Owing to the YPG's egalitarian principles, soldiers had far more leeway to move between units than in a conventional army. Hence, an unpopular or unsuccessful commander could find his unit melt away as personnel transferred to other taburs.

Since crewed vehicles such as tanks, other AFVs and duşkas require specialist infrastructure for maintenance, they were normally concentrated into a brigade's 'heavy weapon' tabur. Heavy weapon taburs could often be much larger in numbers than other units, because of the concentration of hardware in them. They could also be integrated into dedicated units such as the famous Tabur Soran. This tabur was something of an exception, since the commander, who spoke good English, was extremely keen to have foreigners in his unit, whereas others were wary, owing to the linguistic and cultural problems which could arise.

The SDF brigades themselves were organized along the lines of a regional structure, normally created at the canton or major-city level, often subordinate to a local military council, which oversaw their command and supply. These local brigades were responsible for defending their territory and, when advancing against ISIS in areas they claimed or in adjacent territory, for providing a substantial part of the attacking force.

Raising and using forces local to the area, with their own command structure, reflected the principles of decentralization enshrined in the philosophy of Democratic Confederalism. The exponents of this philosophy are suspicious of concentrating military power in the hands of a single group and the potential for the political abuse that brings – indeed, they have attributed the entire Syrian Civil War to such abuse by the Assad regime in the decades leading up to the war.

The local brigades were supplemented by the YPG's Mobile Brigade, which was, in effect, the strategic reserve of the SDF and, hence, was sent wherever it was needed. The Mobile Brigade saw more action and was composed of more experienced soldiers; it was to this brigade that many foreign volunteers gravitated because they were more likely to be involved in major offensive operations against ISIS.

In terms of tactical employment of armour and mobile forces by the YPG/SDF, a set pattern tended to be followed. The small numbers of armoured vehicles available meant that they were not in any position to field groups of vehicles *en masse* in classic combined arms operations where tanks and armoured infantry advanced on a target together, with coordinated fire support from artillery and air power. Instead, duşkas and tanks would be used to harass a target and provide long-range fire support prior to an assault, although they were rarely used during the actual attack, unless the advance became bogged down.

A preparatory bombardment would focus on buildings which may have housed ISIS defenders or strongpoints. In this role, the duşkas were surprisingly effective. By aiming shots at specific targets, such as around windows or firing holes in walls, they forced the defenders either to take cover or to retreat. For this reason, the 14.5mm KPV gun was particularly valued; with its high velocity, flat trajectory and ability to punch through most walls with little effort, this gun was the favoured weapon for offensive tactics.

One SDF T-55 undergoes replenishment and servicing during the drive on Manbij, June 2016. On the engine deck there appear to be two high-explosive shells, two armour-piercing discarding-sabot shells and one HEAT shell. Although a formidable addition to any attack because of their relative scarcity, tanks in SDF hands could range from largely useless to extremely effective, depending on the level of crew competence. (Ed Nash)

The other principal duşka type, based on the ZU 23mm, was favoured for the suppressive capacities of its explosive shell. Even if it did not destroy a house or building, the blast caused by its impact would certainly make defenders shift their position away from its fire.

Owing to their scarcity in the YPG/SDF, tanks were very much a 'trump card'. They would be used in a role probably more comparable to the assault gun of World War II, firing a few rounds from a distance at any likely targets, then leaving the gun line before any ISIS anti-tank crews in the area could be called in. Tanks would certainly not be used to approach the target in an actual attack; they were far too scarce to risk destruction in such a situation.

An assault would normally be undertaken in a set-piece, small-scale fashion. The location for the attack would be observed and a suitable target would be identified. This would normally be a house or building that could be approached quickly by an APC; cover would be provided while the troops exited the APC. An armoured vehicle would be allocated from the operations reserve and infantry taburs would be assigned to the attack. The AFV would be a tracked vehicle such as an MTLB or a BMP-1, but any armoured vehicle could be used if necessary.

There were no niceties in loading up troops for such an operation: as many fighters as possible were crammed into the vehicle. For this reason, many SDF armoured vehicles had as much stripped out of them as possible, including seats; troops were not travelling long distances in them and so comfort – scant enough already in Soviet-era AFVs – was not necessary.

The tactic used was to rush to the drop point and debus the troops as fast as possible; these would then assault the targeted buildings immediately to clear them of resistance and form a bridgehead in the assault area. The APC would generally then leave the area at speed and return to the jumping-off location to collect more infantry to reinforce the spearhead. The original troops would have been pushing out as far and as fast as possible to protect the reinforcement point, while the APC would be making shuttle runs as quickly as it could.

While this was the norm, with a heavy emphasis on protecting the valuable APCs as much as possible, naturally each assault was different. Sometimes crews would stay at the drop point and try to counter enemy

This view from inside an MTLB during an assault gives a graphic illustration of the SDF tendency to cram as many troops into an APC as possible. Taking a hit from one of the RPGs or anti-tank missiles in ISIS hands would usually be a death sentence for those trapped in the burning vehicle. A further form of discomfort was almost inevitably being poked by the muzzle of someone else's weapon. Photograph taken during the al-Hawl offensive, November 2015. (Ed Nash)

resistance. With many of these vehicles mounting 12.7mm and 14.5mm heavy machine guns, they could make short work of a fortified house with close-range fire or, on occasion, by crashing into a structure and bringing it down on the defenders.

If available, any additional armoured vehicles could be used for casualty evacuation. Ideally, the speedier wheeled vehicles would be used for this role, generally Humvees. These could also be delegated to make rapid local attacks themselves, especially when it came to campaigns in the open countryside where the sudden seizure of one of the small villages that dot the terrain was considered necessary.

Here the dedicated Humvee units could attack in force (by militia standards), with perhaps four or five vehicles participating. Rushing into a village, the crews and turret gunners would lay down fire in all directions while on the move. If this tactic succeeded in suppressing any resistance, or there proved to be only a few defenders, the Humvee units could drop their infantry (three or four personnel) and provide close support from their turret

An armoured Humvee of *Tabur Soran*, Serê Kaniyê, September 2015. Note the additional armour plates added to the side windows and to the top of the turret armour to raise the height of the fighting compartment. Traditional tank design has sought to lower a vehicle's profile, but on the plains of Syria a vehicle such as this could act as a mobile observation post. Additional height, especially if providing protection from small arms fire and snipers, could be very valuable. (Ed Nash)

weapons while the troops seized the objective. If resistance was fiercer than expected, the unit could instead beat a hasty retreat after creating havoc.

Naturally, these tactics were the norm when assaulting the outskirts of towns or where more open terrain made movement of troops on foot too vulnerable to enemy fire. For fighting in cities, use of the limited armoured vehicles available had to be more carefully considered. Here they would be used to move infantry up close to the front and to provide rapid evacuation for casualties from the combat area. They would, however, be kept back from the actual front line to avoid the obvious risks, while advancing as close as was possible.

THE YPG/SDF WAR AGAINST ISIS

The war against ISIS conducted by the Kurds and their allies was one war within the wider Syrian Civil War; it was extremely complex, overlapping as it did with other ethnic conflicts, foreign intervention and other offensives against ISIS conducted by the SAA. It is, nonetheless, still useful to provide an outline of the major battles and operations in order that the role of YPG/SDF armoured forces in the defeat of ISIS as a conventional military force, loosely defined, can be understood.

Initial ISIS attacks (2013–14)

Fighting between the various Islamist groups and the YPG occurred throughout the early months of the Syrian Civil War as both sought to gain control over territory in the north of the country. Factionalism between the Jihadi groups allowed the Kurds gradually to carve out a zone of control. The fighting was a series of grinding offensives, often fought a village at a time; it was here that the YPG started to field their IAFVs and early duşkas for fire support.

Following some of the early clashes in 2013, the YPG was able to capture the border town of Serê Kaniyê in mid-July. At the end of that month, while cooperating with al-Nusra, ISIS succeeded in driving Kurdish forces from the border town of Tell Abyad, an event which displaced thousands of Kurdish civilians. In late September, ISIS cooperated this time with the FSA in attacking YPG forces around the town of Atma, by which point the YPG was already employing tanks. By early November, the YPG had captured over 40 villages and towns. On 13 November 2013, the PYD (the political wing of the YPG) announced it planned to create an autonomous government to run the north-east of Syria.

Up until May 2014, individual fights for villages across the north of Syria, especially in the Kobanê and al-Hasakah cantons, continued, with the YPG reporting every now and again the destruction of armoured vehicles and the occasional capture of enemy tanks or other vehicles. In the first half of 2014, most battles fought by the YPG were against 'Daesh forces'.

With the string of ISIS successes in Iraq in 2014, however, the dynamic of the war suddenly changed. In July 2014, Islamist fighters, buoyed by the seizure of Mosul, were directed towards Syria and by this time were well equipped with captured Iraqi Army weaponry. The Jihadists launched a violent attack on the Kurdish areas, which were designed to eradicate any Kurdish control. Towns and cities fell rapidly through the summer as

the YPG/J fought to hold back the militants' advance. ISIS employment of artillery, armour and manpower outgunned the Kurds and they were forced back, despite offering fierce resistance.

The primary ISIS strategy was to attack from its territories west of the Euphrates, rolling up the Kurdish regions situated along the Turkish border. Its first major target was Kobanê.

The battle of Kobanê (15 September 2014–26 January 2015)

On 15 September 2014, ISIS launched a massive offensive with the intention of taking both the city of Kobanê and the entire canton, reputedly deploying 9,000 fighters in total. On 17 September, it moved in the direction of Kobanê, employing tanks and artillery, and soon it was threatening to encircle the city. By 20 September, the Jihadists were within 15km of Kobanê, with tens of thousands of refugees streaming into Turkey as the first rockets began to fall on the city itself.

At the beginning of the battle, only a few hundred Kurdish fighters were present in Kobanê, whereas ISIS was able to throw several thousand fighters into the attack. On 27 September, the USAF began bombing ISIS forces in the region, but initial efforts were limited. On 28 September, Kurdish reinforcements started to arrive in the shape of Kurds crossing over from Turkey (owing to mounting international pressure, Turkish authorities grudgingly allowed some fighters to cross). By 5 October, ISIS fighters had reached the outskirts of the city, despite a desperate defence by the YPG, the units of which consisted of an array of different armed groups. Refugees reported that ISIS forces were murdering and raping civilians and beheading captured Kurdish fighters; these accounts were repeated after the battle by the leading YPG commanders.

Savage street fighting ensued, with both sides using AFVs and duşkas to support their forces. ISIS continued to push hard, including using tanks and other vehicles against the beleaguered defenders. By 12 October, the Jihadists were in control of over half the city, gradually squeezing the YPG/J down to some districts located close to the Turkish border. Nonetheless, in the narrow streets of Kobanê, YPG fighters were able to destroy ISIS tanks with RPG fire (they claimed 18 tanks destroyed during the battle); others fell victim to US air attacks.

The defenders, however, managed to retain control of the critical border crossing, fighting off five separate assaults on it. The turning point in the battle (and, arguably, the entire war against ISIS) occurred between 13 and 15 October when US airstrikes were increased, blunting the militants' offensive capability by targeting their tanks and other support vehicles, also destroying troop

An early duşka used during the battle of Kobanê in 2014. Note the single-barrelled 14.5mm KPV, the crudely constructed shield and uncamouflaged Great Wall pick-up chassis. (NurPhoto via Getty Images)

After the defeat of ISIS at Kobanê in late January 2015, considerable quantities of damaged armour fell into YPG hands. This was collected in the centre of the city and systematically picked over by mechanics to recover anything that might be recycled in other vehicle repairs or conversions. If nothing else, armour plate could be salvaged for building IAFVs and duşka shields. Pictured here are a BMP, an armoured Humvee (above left) and the turret of a T-72 tank (above right). Kobanê, July 2015. (Ed Nash)

concentrations. By the end of the battle, ISIS had lost somewhere between 2,000 and 5,000 fighters killed in action. Another key moment was on 29 October when Turkey, reacting again to international pressure, permitted 50 FSA fighters to enter Kobanê. Two days later they allowed 150 Peshmerga fighters to cross, this time bringing 20 wheeled vehicles with rocket launchers and heavy weapons mounted on them.

The battle continued to rage until 26 January 2015, with ISIS mounting a number of heavy attacks (including suicide bombings) aimed at halting the steady YPG advance; but the stubbornness of the defenders, combined with greater coordination with coalition air power, ground the ISIS forces down. The skilful small-unit tactics of the Kurdish forces, including the use of largely improvised armoured vehicles, finally forced the Islamists back, despite the fact that they had been able to employ between 30 and 50 T-55 and T-72 tanks in the offensive.

The siege of Kobanê was highly significant for the Kurdish war against ISIS. It marked the first major defeat for the Islamic State, shattering the belief in its supposed invincibility. It came to be symbolised by a new Kurdish heroine, a young YPJ fighter named Arîn Mîrkan, who had sacrificed herself on 5 October 2014 to save her comrades during the fighting for the strategically important Mishtanour Hill, overlooking the city. It saw the cooperation of YPG and Peshmerga forces, overcoming decades of tensions. It also became the springboard for the counter-offensives that were to liberate the territory ISIS had recently seized. Finally, although 70 per cent of the city was reduced to rubble, the battle had led to the capture of a number of AFVs, including the destroyed remnants of tanks and other AFVs, which the YPG was able to cannibalize as it started to create mobile forces that improved upon its early 'Mad Max' vehicles.

F

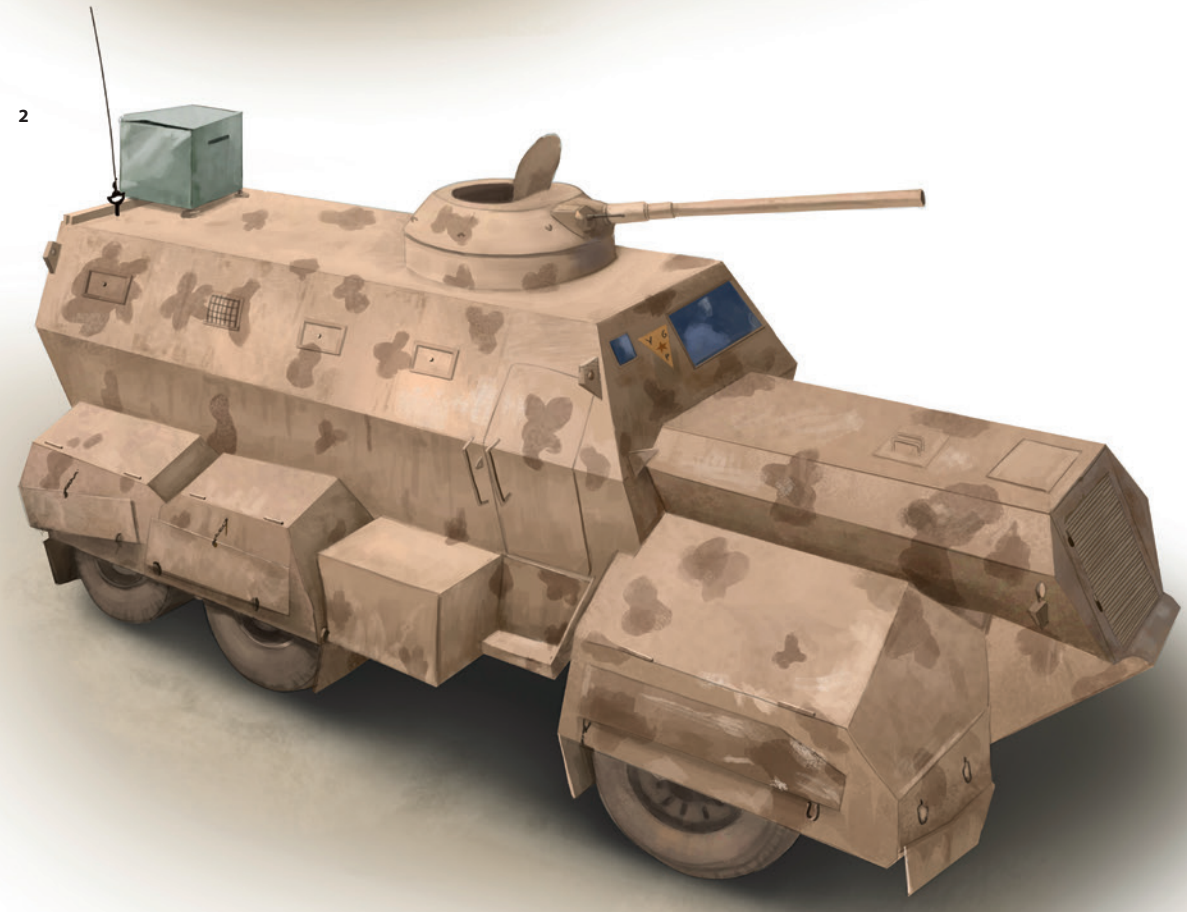
IMPROVISED ARMOURED CARS

1. 'Hero of Kobanê' armoured car. This armoured car has been constructed around a civilian vehicle. A turret has been added, which houses a Chinese 12.7mm W-85 heavy machine gun. The letters YPG have been crudely painted on the side, but no other paintwork has been applied. It was one of the few vehicles available to the YPG during the first phase of the battle of Kobanê, performing crucial fire-support and other transportation functions.

2. Improvised armoured car with BMP turret. This vehicle may represent the pinnacle of YPG conversions, with a BMP-1 turret fitted to the chassis of a civilian truck, complete with 73mm cannon and co-axial machine gun.

1

2



Originating from such varied stocks, many of the SDF tanks were not in particularly good condition. This T-54/55 on the drive to al-Hawl in November 2015 apparently had a problem with its gun sight. The crew took to taping a string crosshair over the muzzle. They would aim the gun by looking down the barrel at the target, load a shell and then fire. The effectiveness of such a measure was what one would expect. (Ed Nash)

The al-Hasakah offensives (21 February–17 March 2015 and 6 May–31 May 2015)

With the defeat of the ISIS offensive against Kobanê, the YPG and its allies began a counter-offensive designed to reclaim the territories lost in mid-2014. Rojava had been split in two by ISIS, with the Kurds and their allies left holding a large pocket in the Kobanê canton in the west and a larger region in the al-Hasakah province to the east.

The initial operation began with the intention of retaking areas of the Jazira canton, which would secure the YPG positions in the east along the Iraqi border and protect its de facto capital of Qamişlo. Key to this was the clearing of the city of al-Hasakah and the towns of Tell Brak and Tell Hamis. These campaigns were marked by a more extensive use of mobile forces. The capture of increasing numbers of ISIS vehicles, primarily unarmoured Toyotas, but also some AFVs, allowed the YPG allied forces to move greater numbers of troops over longer distances.

A few days into the first offensive, ISIS counter-attacked with 3,000 fighters supported by tanks. However, the US-led coalition launched a number of air strikes on the Jihadists, destroying seven ISIS vehicles and 18 tactical units. Although ISIS still had stronger ground forces, the combination of determined Kurdish and Arab attacks, supported by US air power, was having the desired effect. Fighting was particularly heavy in the area around Tell Tamer. After the fighting had died down in April, the YPG had made significant gains, pushing ISIS back southwards from Qamişlo.

The western al-Hasakah offensive was, in many ways, even more successful, as the YPG and the SMC drove westwards along the Turkish border, pushing ISIS back, capturing the countryside around Serê Kaniyê. This offensive saw the Kurds employ T-55 tanks and other AFVs; although losing 55 dead, ISIS lost somewhere between 270 and 700 dead.

The Tell Abyad offensive (31 May–10 July 2015)

As an extension of the western al-Hasakah offensive, a further operation took place to capture Tell Abyad, an important border crossing between Syria and Turkey. The successful operation deprived the ISIS capital of Raqqa of its final communication link with Turkey, while also linking up the Kobanê and Jazira cantons in northern Syria. YPG and FSA forces then pushed south of Tell Abyad; by 24 June they had advanced to within 35km of Raqqa. On 10 July, the offensive was declared to be concluded.

The battle of Sarrin (18 June–27 July 2015)

Located to the south-west of Kobanê, Sarrin had fallen to ISIS in March 2014. Following an earlier offensive in March and April, which had stalled, the YPG – in conjunction with FSA attacks – was finally able to capture

In the YPG/SDF armour force it was quite common to find 23mm cannon mounted on larger vehicles, like this truck, which could better cope with their weight and recoil. Vehicles such as this provided the main form of direct fire support for the YPG/SDF counter-offensives against ISIS. Photographed at Tell Tamer, October 2015. (Ed Nash)

Sarrin on 27 July, as well as 25 villages in the surrounding region. While hard fought, this was an important victory, as Sarrin had been the last ISIS stronghold in the Kobanê canton; its capture also cut the main ISIS route to the Aleppo Governate.

The battle of al-Hasakah (23 June–1 August 2015)

The attempt by ISIS to capture the city of al-Hasakah ended in a dramatic failure for the Jihadi forces. In the course of the battle the YPG cooperated with SAA units, succeeding in surrounding the ISIS fighters in the city. According to the YPG, who lost 21 fighters, 386 militants were killed. The failure led to huge internal recriminations within the ISIS leadership, with several men who were accused of desertion executed by their own commanders.

YPJ fighters celebrate the liberation of al-Hawl atop a captured ISIS VBIED, November 2015. These were one of the Islamic State's most feared weapons and could reach considerable sizes. If captured, such vehicles were salvaged for any useful parts or steel plates. Later ISIS VBIEDs were much better protected than this one, which was obviously furnished with armour plating in a hurry. (Ed Nash)

The al-Hawl offensive (31 October–30 November 2015)

The first offensive launched by the newly created SDF saw the important town of al-Hawl to the south-east of al-Hasakah city captured, along with 240 towns and villages, together with two oilfields and the South al-Hasakah Dam. SDF forces had successfully conquered 1,400sq km of territory; although they lost 33 fighters killed, they claimed ISIS had suffered losses of 493 killed. While this offensive was ongoing, YPG forces also cooperated with the Kurdish Peshmerga in the recapture of the city of Sinjar from ISIS (12–15 November); the operation led to the successful cutting of the route connecting Raqqa and Mosul.

Tishrin Dam (23–30 December 2015)

Between 23 and 30 December 2015, the SDF launched an operation against ISIS that saw it capture the Tishrin Dam in the north-eastern Aleppo Governate, in addition to over 100 villages, gains which amounted to 640sq km of

A prominent role was played by the Toyota Hilux, seen here during the advance on Manbij, May 2016. Assault vehicle, personnel carrier and logistics stalwart, the Hilux was the most numerous and, arguably, the most important vehicle in all YPG/SDF campaigns. Initial supplies came from captured ISIS stocks after the relief of Kobanê, although these were rapidly supplemented by vehicles supplied through Iraqi Kurdistan by the international coalition. Camouflage was frequently wet mud, applied at the beginning of an operation, then cleaned off after its conclusion. (Ed Nash)

territory. During the operation, the Jihadists lost 300 fighters killed; the SDF pushed further down the eastern bank of the Euphrates, also advancing across to the western bank of the river and threatening the southern approaches to the city of Manbij. This was another sweeping attack that would not have been possible without mobile forces.

The al-Shaddadi offensive (16–24 February 2016)

A similar pattern of mobile operations, supported by US air power, could be observed in the al-Shaddadi offensive, countered largely ineffectively by ISIS through its desperate attempts to halt the advances through VBIED attacks. Employing 6,000 fighters, the SDF succeeded in capturing the strategically important city of al-Shaddadi, at least 315 villages and territory amounting to 2,400sq km, at the cost of 26 fighters killed, but with ISIS losses running to over 450. The unexpected collapse of ISIS forces indicated a growing competence in mobile warfare on the part of the SDF.

The Manbij offensive (31 May–21 August 2016)

A major operation in 2016 was the successful capture of Manbij by the SDF. During the opening moves, US special forces, who were supporting

A tank engages ISIS with its main gun, Manbij, June 2016. Note the location of the crew. On this tank, at least, they fired the cannon by running a lanyard out of the turret and taking cover on the engine decking. One assumes the crew had little faith in the state of the gun and wanted to avoid the risk of death or injury from a breech explosion. Breech detonations did occur; at least one which took place in the turret of an FSA T-55 was captured on film. (Ed Nash)

the offensive, employed an armoured vehicle launched bridge to enable SDF forces to cross the Euphrates at the site of the demolished Qara Qozak Bridge. The SDF advance aimed to envelop Manbij rather than try to assault it directly. By 10 June, the SDF had surrounded Manbij completely; the city finally fell on 12 August. During the heavy fighting to reduce ISIS positions, T-55 tanks and duşkas were employed, with improvised armoured cars with turret-mounted machine guns still in use.

The Raqqa campaign (6 November 2016–20 October 2017)

The decisive campaign conducted by the SDF was a series of offensive operations aimed at the capture of the de facto ISIS capital of Raqqa. It was to be conducted in two phases, in an operational concept comparable to the Manbij offensive, with the city to be advanced upon from three sides, thereby isolating it. It was an extremely difficult undertaking, since a portion of the 20,000 ISIS fighters in Mosul were transferred to Raqqa to help defend 'the capital' of the Caliphate.

It was a large campaign involving 40,000–50,000 SDF fighters, which included 25,000 YPG/J fighters, some FSA units, other groups, and 900 US special forces; the SAA also cooperated in the offensive. By this stage in the war, US aid was starting to improve SDF capabilities, with IAG Guardian and MRAP (mine-resistant ambush protected) armoured cars starting to appear. The SDF was now using lorries as tank transporters to reduce the wear and tear on its AFVs. Pick-up trucks continued to be captured from ISIS during the operation. Victory was finally declared on 20 October 2017, but with huge sections of Raqqa city destroyed in the fighting.

Setbacks and victory over ISIS (2017–19)

Following the conquest of Raqqa, which had taken place in parallel with the Iraqi Army's recapture of Mosul in northern Iraq, the SDF faced a new

ABOVE LEFT
What appears to be a variant of the BRDM-2 used by the SDF at a village north-east of Raqqa, February 2017. A useful addition to its limited vehicle fleet, the BRDMs had been retired by the SAA before the war and were salvaged by the YPG. This vehicle has had storage boxes and armour protection added to the wheels, although the front wheel protection appears to be unsecured and probably made a considerable noise while it was being driven. The louvres on the back may also have been added to improve engine cooling in the desert. (DELIL SOULEIMAN/ AFP via Getty Images)

ABOVE RIGHT
SDF Humvees during the battle of Raqqa, September 2017. The vehicle on the left is armed with what appears to be an American AN/M3 heavy machine gun. Note the use of an additional sheet of metal to form a crude 'roof' for the fighting compartment. These have been common additions for armed forces with experience of urban warfare. (DELIL SOULEIMAN/ AFP via Getty Images)

G **ISIS VBIED ATTACK ON SDF POSITION, AL-SHADDADI, 20 FEBRUARY 2016**

VBIEDs (Vehicle borne improvised explosive devices) were employed frequently by ISIS to try to slow the YPG/SDF advances, following their defeat at Kobanê. Given the support provided by coalition air power, this was often the most potent weapon at their disposal. The threat from VBIEDs was the reason why the SDF used diggers to create a defensive berm around any static position it occupied. Pictured here is an attack on the SDF outside the town of al-Shaddadi. The position protected the main command post coordinating the drive on the town. As it held a concentration of duşkas and a T-55 tank, it was an obvious target for ISIS. Even though the SDF forces engaged it with a range of small-arms, machine guns and RPGs, it was destroyed by a Javelin missile fired by French special forces.

challenge when Turkey launched the cynically named Operation *Olive Branch*, supported by its own proxy units fighting under the FSA flag. They sought to counteract Kurdish gains by invading the Afrin region of north-west Syria, with its majority Kurdish population. The main phase of the Turkish operation lasted from 20 January to 24 March 2018. At this point, however, the token US presence in northern Syria acted as a block on further Turkish advances, with the YPG switching to guerrilla tactics in Afrin.

Despite the occupation of Afrin, the SDF continued to push ISIS back in the south-eastern regions of Syria; following an agreement to allow some ISIS fighters to leave Raqqa with their families, the battered remnants of ISIS had retreated south. Even before the final militant defeat in Raqqa, the SDF had begun an operation in parallel with the SAA (there is no evidence of formal cooperation) to force ISIS towards the Iraqi border, the SDF advancing along the eastern bank of the Euphrates and the SAA along the western bank.

There were three phases to the final defeat of ISIS ground forces, during which the usual combination of SDF AFVs were employed: 8 September 2017–5 March 2018; 1 May–4 August 2018; and 10 September 2018–23 March 2019. In the final phase, ISIS continued to resist, launching numerous counter-attacks, often using bad weather as cover. At last, the remaining core of mainly foreign Jihadists was defeated on 23 March 2019 at the settlement at al-Baghuz, with thousands of family members and fighters heading into captivity.

CONCLUSION

There is little doubt, despite the contribution made by the SAA, and a host of other armed groups, that the main credit for the defeat of ISIS in Syria

An SDF duşka in the final battle at al-Baghuz, March 2019. This is probably an example of harassing fire rather than fire support. Night fighting could be a hazardous undertaking for the SDF, with friendly fire incidents not an uncommon occurrence among advancing forces. However, sporadic firing at night deterred ISIS counter-attacks using the cover of darkness, sometimes including fighters equipped with suicide vests, so that by daybreak the SDF could be dug in and prepared. (BULENT KILIC/AFP via Getty Images)

Air power was a critical element in the war, providing the SDF with its most powerful weapon. In the final days, forced into a last stand, the detritus of war scattered about them, ISIS was blasted mercilessly by coalition air power and artillery until the final advances of the SDF infantry and armour took the last narrow strip of its territory at al-Baghuz, 23 March 2019. (DELIL SOULEIMAN/AFP via Getty Images)

must be accorded to the Kurdish fighters and their Arab allies. In defeating a fanatical enemy, who for much of the war was better equipped in heavy weapons, US air support was certainly a major factor. But there is equally little doubt that the odd assortment of IAFVs, duşkas, coalition-supplied wheeled vehicles, captured tanks and APCs was essential to moving its forces across vast expanses of Syrian territory. Without these vehicles, the YPG/SDF forces would never have emerged victorious in 2019.

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